

WE CLAIM:

1. A method for categorizing patients who have been treated with 5-FU, comprising:
 - determining a copy number of a gene encoding thymidylate synthase in tumor tissue of a patient who has been treated with 5-FU;
 - assigning the patient to a first category if the patient has a hyperdiploid copy number relative to one or more other genes located on chromosome 18, and assigning the patient to a second category if the patient does not have a hyperdiploid copy number relative to one or more other genes located on chromosome 18.
2. The method of claim 1 wherein the tumor tissue is metastatic tumor tissue.
3. The method of claim 1 wherein a hyperdiploid number is assigned if the gene encoding thymidylate synthase has an increased copy number relative to one or more other genes on chromosome 18p.
4. The method of claim 1 further comprising recommending that a patient assigned to the first category not be treated with 5-FU
5. The method of claim 1 further comprising recommending that a patient assigned to the second category be treated with 5-FU.
6. The method of claim 1 further comprising:
 - predicting a reduced life expectancy for a patient assigned to the first category relative to patients in the second category.
7. The method of claim 1 further comprising:

predicting a longer life expectancy for a patient assigned to the second category relative to patients in the first category.

8. The method of claim 1 wherein the copy number is determined in tumor epithelial cells of the metastatic tumor tissue.
9. The method of claim 8 wherein the tumor epithelial cells are immunopurified.
10. The method of claim 1 wherein the copy number is determined by digital karyotyping.
11. The method of claim 1 wherein the copy number is >3 per diploid genome.
12. The method of claim 1 wherein the copy number is determined by fluorescence in *in situ* hybridization.
13. The method of claim 1 wherein the patient had a primary colorectal tumor.
14. The method of claim 1 wherein the tumor tissue is from a lung metastasis.
15. The method of claim 1 wherein the tumor tissue is from a liver metastasis.
16. A method of screening agents for ability to treat 5-FU resistant tumors comprising:

contacting a test agent with (1) first human cells having a hyperdiploid copy number of thymidylate synthase gene relative to one or more other genes located on chromosome 18; and (2) second human cells having a diploid copy number of thymidylate synthase gene;

determining a parameter for each of the first and second human cells, said parameter selected from the group consisting of: apoptosis, growth rate, viability, and colony number;

identifying the test agent as a candidate for treating 5-FU resistant tumors if the agent preferentially increases apoptosis or decreases growth rate, viability, or colony number in the first human cells relative to the second human cells.

17. The method of claim 16 wherein the first and second human cells are tumor cells.
18. The method of claim 16 wherein the first and second human cells are from the same patient.
19. A method of assessing agents for ability to treat 5-FU resistant tumors comprising:
 - contacting a test agent with (1) a first population of humans having a tumor with a hyperdiploid copy number of thymidylate synthase gene relative to one or more other genes located on chromosome 18; and (2) a second population of humans having a tumor with a diploid copy number of thymidylate synthase gene;
 - determining a parameter for each of the first and second populations, said parameter selected from the group consisting of: tumor regression, tumor marker decrease, and clinical condition;
 - identifying the test agent as a candidate for treating 5-FU resistant tumors if the agent preferentially or equally increases tumor regression, tumor marker decrease, or improves clinical condition in the first human population relative to the second human population.
20. The method of claim 19 wherein the tumor is a metastatic tumor.